medicinal plants, which are valuable natural resources," said Susanne Honnef of TRAFFIC. "The ISSC-MAP principles and criteria show how this can be achieved in practice."[2,3]

More than 400 000 tonnes of MAP are traded annually, with around 80% of the species harvested from the wild. Almost 70 000 species are involved, with many of them in danger of over-exploitation and even extinction through over-collection and habitat loss. For example, The World Conservation Union (IUCN) considers that almost 300 medicinal plants are threatened in India.

Traditional Medicinals, one of the industry's leading companies, is investigating applying the new standard to the collection of Bearberry (*Arctostaphylos* spp.), a shrub whose leaves are used for the treatment of a variety of conditions, mainly associated with diuresis and the urinary tract.

"Our German supplier was able to prove the sustainability of their Bearberry sources, and we are keen to see how the newly developed ISSC-MAP criteria apply to this trade. Sustainable supplies will mean long-term benefits for the local people who rely on the Bearberry trade for supplementary income," said Josef Brinckman, Vice-President of Traditional Medicinals.

"I welcome the launch of this new standard, which presents an important step in ensuring the sustainable use of natural pharmaceutical products," said Professor Drenckhahn, President of WWF-Germany. "We'd like to see other companies use the standard and see how it works in practice for their benefit."

Those attending the EXPO West trade fair (9–11 March 2007), Anaheim CA, USA, were able to hear more about the ISSC-MAP standard from Dr Danna J. Leaman, chair of the Medicinal Plant Specialist Group (MPSG) for IUCN; and Josef Brinckman, Vice-President of Traditional Medicinals.

[2] TRAFFIC, the wildlife trade monitoring network, works to ensure that trade in wild plants and animals is not a threat to the conservation of nature. TRAFFIC is a joint programme of WWF, the conservation organization, and IUCN – The World Conservation Union.

[3] ISSC-MAP is based on six principles: maintaining wild MAP resources; preventing negative environmental impacts; legal compliance; respecting customary rights; applying responsible management practices; and applying responsible business practices. It can be downloaded from http://www.floraweb.de/proxy/floraweb/map-pro/

Efforts for breeding drought tolerant rice in Venezuela

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Latin America and Caribbean (LAC) countries do not escape the worldwide concern about drought and its effects on rice cultivation. In this region, rice is cultivated mainly under irrigated conditions. Although per capita water availability in LAC is the highest among continents, this advantage is decreasing. In the recent past, rice cultivation in several LAC countries experienced water shortage problems. In Venezuela, for example, inadequate water availability in the main producing areas, resulting from a three-year drought, affected paddy production in the last two years (FAO 2004). Thus it is felt that, as in many other regions of the globe with water stress conditions, rice production in LAC countries will also have to adopt strategies that allow more efficient water use in irrigation schemes.

Recently, Venezuela joined the global efforts for breeding drought-tolerant rice. Last January, our research team, comprising plant physiologists, plant breeders and molecular biologists from the Instituto Venezolano de Investigaciones Científicas (Venezuelan Institute for Scientific Research, IVIC), the Instituto Nacional de Investigaciones Agrícolas (National Institute for Agricultural Research, INIA) and the International Center for Tropical Agriculture (CIAT) initiated a research project that has as its long-term goal the identification and breeding of rice cultivars tolerant to drought.

Our research strategy consists of three phases: (i) characterize the drought tolerance of various rice cultivars; (ii) identify the most important traits associated with drought tolerance in these cultivars; and (iii) develop genetic maps and identify quantitative trait loci (QTL) associated with drought tolerance. For this we are screening accessions from Venezuelan germplasm, mainly lowland varieties, in order to identify new donor germplasm exhibiting stable performance under water stress, with good yield potential and having drought tolerance mechanisms that can provide potential new genes and QTLs for the breeding pool. These accessions represent traditional and novel *Oryza sativa* L. materials from Venezuelan germplasm.

In addition to local germplasm, we are evaluating *Oryza glaberrima* (IRGC accession 103544) and *Oryza sativa* cv. Caiapo in order to establish their potential as donors or recipients in drought-breeding programmes. The characterization of these materials will also be useful for determining the suitability of a Caiapo × *O. glaberrima* mapping population—developed by CIAT—for identification of drought-related QTLs. *O. glaberrima* is the native cultivated rice in West Africa. Some accessions of this species, as well as some lines derived from crossing with *O. sativa* (NERICA lines), exhibit enhanced tolerance to several abiotic stresses, including drought (Jones et al. 1997; Gridley et al. 2002; Sarla and Mallikarjuna-Swany 2005). Cv. Caiapo is a tropical japonica commercial variety developed by the Brazilian rice programme for upland conditions (EMBRAPA 1997) and has been reported as moderately tolerant to drought (Pinheiro 2003). The Caiapo × *O. glaberrima* population consists of 93 chromosome segment substitution lines (CSSLs), which represent 95% introgression of *O. glaberrima* (IRGC accession 103544) into the Caiapo genome. A genetic map for this population is already available (Lorieux, pers. comm.). CSSLs will be evaluated for yield and selected drought-related traits, such as osmotic adjustment, leaf rolling, maintenance of leaf water potential, water conductance, photosynthetic capacity and root length.

The genetic materials included in the study might exhibit different mechanisms important in determining tolerance to water stress. Thus, we potentially have the opportunity to identify and map different traits.

Developing drought-tolerant cultivars—through molecular breeding—is considered one of the most effective strategies for enhancing water-use efficiency in rice cultivation. Many rice varieties tolerant to drought are known, and several putative traits conferring drought tolerance have been identified (Fukai and Cooper 1995; Lafitte et al. 2003). Furthermore, genotypic variation for several of these traits has been reported (Price et al. 2002). However, drought tolerance is a complex trait, controlled by the interaction of many genes, that involves several physiological, biochemical, phenological, and morphological mechanisms (Blum 1988). This polygenic nature of drought tolerance implies that several genetic regions must be manipulated simultaneously to have a significant impact on crop performance under water-limited conditions. QTL mapping offers an opportunity to identify those regions or loci conferring tolerance to drought (Tuberosa 2004).

However, the breeding of new materials with enhanced drought tolerance could take a long time. Our step-by-step approach offers the opportunity to identify local cultivars that can perform better under environments with limited irrigation facility. In the short term, cultivation of these materials can be promoted to reduce water use. This approach also represents an advantage for breeding new materials, as local varieties already show adaptation to our agroecological conditions, with yield and grain quality acceptable to producers.

In Venezuela, the molecular characterization of rice cultivars has been very limited. Genotyping of the 8 Venezuelan cultivars included in this study, which are extensively grown in the country, will offer molecular information for other areas of research, plant breeders and also the seed industry.

The collaboration of CIAT in the project is helping to strengthen personnel capacities in the country in the area of biotechnology, through training students and researchers. At the same time, IVIC and INIA are exchanging expertise in crop physiology, biochemistry and plant breeding. We look forward to establishing collaborative links with other research institutes, both national and international, in this area of research. In the next few months, we are launching a Web site (www.ivic.ve/retoarroz) containing information about the project, training opportunities, publications, etc.

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